

Observation of Coherent $\phi(1020)$ Resonance in Photonuclear Ultra-Peripheral Au+Au Collisions at STAR

Xihe Han
The Ohio State University
han.1929@osu.edu

Abstract

We present the first measurement of photoproduction of ϕ mesons in ultra-peripheral Au+Au collisions at a center-of-mass energy of $\sqrt{s_{NN}} = 200$ GeV using the STAR detector at RHIC. The ϕ mesons are reconstructed through their decay into $K^+ K^-$ pairs, enabled for the first time by the extended low transverse momentum (p_T) coverage provided by the STAR inner TPC upgrade. The ϕ meson measurements complement previous vector meson studies (ρ^0 , J/ψ), allowing for investigations into the mass dependence of photoproduction processes and providing new insights into the nuclear gluon distribution.

In this presentation, we report coherent ϕ photoproduction differential cross sections as functions of transverse momentum (p_T) and rapidity (y). Our comparative analysis with the previous STAR measurements shows that the ϕ meson photoproduction cross section falls between those of ρ^0 and J/ψ , highlighting the transition from soft to hard photoproduction regimes. This measurement provides new constraints on theoretical models of photonuclear interactions and enhances our understanding of the nuclear gluon structure at low x .